PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference MIW/SS/41822	**FOR FURTHER ACTION**	See Form PCT/IPEA/416
International application No. PCT/GB2004/001177	International filing date *(day/month/year)* 19.03.2004	Priority date *(day/month/year)* 20.03.2003
International Patent Classification (IPC) or national classification and IPC A24C5/34		
Applicant MOLINS PLC et al.		

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 6 sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:
   a. ☒ *sent to the applicant and to the International Bureau)* a total of 1-5 sheets, as follows:
      ☒ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
      ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
   b. ☐ *(sent to the International Bureau only)* a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:

☒	Box No. I	Basis of the opinion
☐	Box No. II	Priority
☐	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☐	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☒	Box No. VII	Certain defects in the international application
☐	Box No. VIII	Certain observations on the international application

Date of submission of the demand	Date of completion of this report
08.10.2004	16.06.2005
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer Hoogen, R Telephone No. +49 89 2399-2192

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/GB2004/001177

Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

   ☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:
   - ☐ international search (under Rules 12.3 and 23.1(b))
   - ☐ publication of the international application (under Rule 12.4)
   - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)

2. With regard to the **elements*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

Description, Pages

1-14	as originally filed

Claims, Numbers

1-22	received on 22.01.2005 with letter of 19.01.2005

Drawings, Sheets

1/3-3/3	as originally filed

☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. ☒ The amendments have resulted in the cancellation of:
   - ☐ the description, pages
   - ☒ the claims, Nos. 23-29
   - ☐ the drawings, sheets/figs
   - ☐ the sequence listing *(specify)*:
   - ☐ any table(s) related to sequence listing *(specify)*:

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
   - ☐ the description, pages
   - ☐ the claims, Nos.
   - ☐ the drawings, sheets/figs
   - ☐ the sequence listing *(specify)*:
   - ☐ any table(s) related to sequence listing *(specify)*:

* *If item 4 applies, some or all of these sheets may be marked "superseded."*

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-22
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-22
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-22
	No:	Claims	

2. Citations and explanations (Rule 70.7):

see separate sheet

Box No. VII Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Reference is made to the following documents:

D1: EP 0 758 742 A D2: EP 1 028 305 A D3: FR 2 256 394 A

Document D1 describes a machine vision equipment for determining the degree of offset of the fiber core of an optical fiber from the theoretical ideal center (cf. col. 10, l. 45-48), the equipment comprising:

imaging means (cf. column 10, line 55 - column 11, line 2) comprising a camera defining a field of view and being adapted to form an image of an endface of said optical fiber within said field of view (cf. column 14, lines 26-36), and processing means for processing said image for determining the offset of said fiber core of said optical fiber (cf. column 11, lines 25-34);

first supporting means for supporting the optical fiber within said field of view at a predetermined distance from said camera (cf. column 19, lines 50-56);

adjusting means for automatically adjusting the focus of the imaging means (cf. column 11, lines 35-44);

optimum focus determining means for determining the optimum focus of said imaging means by processing one or more images of a reference object placed on the first supporting means (cf. column 25, line 40 - column 26, line 3); and

controlling means for controlling operation of said imaging means, adjusting means, and optimum focus determining means for imaging the reference object, determining the optimum focus of the imaging means, and adjusting the imaging means to said optimum focus (cf. column 26, lines 4-8).

The apparatus according to claim 1 differs from this disclosure in that it further comprises

a) second supporting means for supporting a reference object having at least one accurately known dimension; and

b) moving means for selectively moving one or more of the camera, the first supporting means, and the second supporting means such that a reference object placed on the second supporting means is disposed within the camera's field of view at said

predetermined distance from said camera; and

c) in that it is suitable for determining one or more physical properties of a rolled smoking article or filter rod.

By means of features a) and b) repetitive manual placement of the reference object on the first supporting means is avoided.

The technical problem solved by features a) and b) may therefore be seen in modifying the system of D1 such that configuration adjustments may be performed in a fully automated way.

Document D2 describes an apparatus for determining the diameter of a thread using an optical sensor, the apparatus comprising second supporting means for supporting a reference object having at least one accurately known dimension and moving means for selectively moving the second supporting means such that a reference object placed on the second supporting means is disposed within the sensor's field of view (cf. paragraph [0026]).

Document D3 discloses an apparatus for determining the diameter of a fibre using an optical sensor, the apparatus comprising second supporting means for supporting a reference object (cf. figure 2: two V-shaped grooves in a block: one for the test object and one for the reference object) and moving means for moving the camera such that the reference object placed on the second supporting means is disposed within the sensor's field of view (cf. page 7, lines 18-24).

Features a) and b) are therefore considered to be obvious in view of D2 or D3.

However, the machine vision equipment disclosed in D1-D3 is adapted to be used for inspecting threads or fibers and does not appear to be suitable for investigating rolled smoking articles or filter rods, for example the supporting means are not adapted to hold rolled smoking articles or filter rods. Thus, even by combining D1 with D2 or D3, one would not arrive at machine vision equipment according to claim 1. Also D1-D3 do not contain any hint suggesting the applicability of the equipment or methods described therein for inspecting rolled smoking articles or filter rods.

The subject-matter of independent apparatus claim 1 and, mutatis mutandis, independent method claim 12 is therefore considered to be new and inventive.

Claims 2-11 and 13-22 are dependent on claims 1 and 12, respectively, and as such also meet the requirements of Articles 33 (2) an d(3) PCT.

Re Item VII

Certain defects in the international application

1. The description is not in conformity with the claims as required by Rule 5.1(a)(iii) PCT.

   Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the documents D1-D3 is not mentioned in the description, nor are these documents identified therein.

   The reference PCT/GB2004/xxxxxx is incomplete.

2. The features of the claims are not provided with reference signs placed in parentheses (Rule 6.2(b) PCT).

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Claims

1. Machine vision equipment for determining one or more physical properties of a rolled smoking article or filter rod, the equipment incorporating automatic set-up means, and comprising:

imaging means comprising a camera defining a field of view and being adapted to form an image of said article or rod within said field of view, and processing means for processing said image for determining one or more physical properties of said article or rod;

first supporting means for supporting said article or rod within said field of view at a predetermined distance from said camera;

second supporting means for supporting a reference object having at least one accurately known dimension;

moving means for selectively moving one or more of the camera, the first supporting means, and the second supporting means such that a reference object placed on the second supporting means is disposed within the camera's field of view at said predetermined distance from said camera;

adjusting means for automatically adjusting the configuration of the imaging means;

optimum configuration determining means for determining the optimum configuration of said imaging means by processing one or more images of a reference object placed on the second supporting means; and

controlling means for controlling operation of said moving means, imaging means, adjusting means, and optimum configuration determining means for bringing a reference object supported by said second supporting means into the camera's field of view, imaging said reference object, determining the optimum configuration of the imaging means, and adjusting the imaging means to said optimum configuration.

2 Machine vision equipment as claimed in claim 1, characterised in that said optimum configuration determining means are adapted for determining the optimum configuration of the imaging means by processing a plurality of images of said reference object obtained with said imaging means in different respective configurations, and said controlling means are adapted to control said imaging means, adjusting means, and optimum configuration determining means to obtain and process serial images of said reference object means whilst adjusting progressively the configuration of the imaging means, and to determine the optimum configuration on the basis of said serial images.

3 Machine vision equipment as claimed in claim 2, characterised in that said adjusting means are adapted for adjusting the focal length of the camera, said optimum configuration determining means comprise optimum focal length determining means, and said controlling means are adapted for controlling the adjusting means, imaging means, and optimum focal length determining means to obtain and process serial images of the reference object at different respective focal lengths, and to determine the optimum focal length at which the reference object is best in focus, and for controlling the adjusting means thereafter to adjust the focal length of the camera to said optimum focal length.

4 Machine vision equipment as claimed in claim 1, claim 2, or claim 3, characterised in that said second supporting means are configured to support a reference object having substantially the same shape and size in substantially the same orientation in said field of view as said article or rod.

5 Machine vision equipment as claimed in any preceding claim, characterised in that said camera comprises a digital camera which is adapted form said image as a regular array of pixels.

6 Machine vision equipment as claimed in claim 5, characterised in that said configuration determining means comprise calibration determining means adapted to compare an actual measured value of said at least one dimension of said reference object with said accurately known value, said adjusting means are adapted for adjusting the calibration of said imaging means, and said controlling means are configured for controlling said imaging means, calibration determining means and adjusting means for measuring said at least one dimension of said reference object to obtain a measured value, comparing said measured value with the accurately known value, and adjusting the calibration of the imaging means accordingly such that the measured value equals the known value.

7 Machine vision equipment as claimed in claim 6, characterised in that said second supporting means are adapted to support a plurality of reference objects, each having substantially the same shape as said article or rod, but each having a different respective, accurately known value of said at least one dimension, said moving means are adapted for selectively moving one or more of the camera, first supporting means and second supporting means to bring each reference object in turn into the camera's field of view at the said predetermined distance from the camera; and said calibration determining means are adapted for comparing the measured value of said at least one dimension of each

reference object with the respective accurately known value, and to generate a calibration curve for said imaging means on the basis of said comparisons.

8 Machine vision equipment as claimed in claim 7, wherein said second supporting means is adapted to support three or more reference objects.

9 Machine vision equipment as claimed in claim 8, wherein each reference object comprises a cylindrical bar of accurately known diameter.

10 Machine vision equipment as claimed in claim 9, characterised in that said second supporting means comprises at least one holder for holding each reference object, each holder defining a V-shaped cavity which is configured to receive transversely a cylindrical reference bar at the same depth into the cavity regardless of the diameter of the bar.

11 Machine vision equipment as claimed in claim 10, wherein said second supporting means comprises two holders for holding each reference object, one holder at or towards each end of the respective bar.

12. A method of setting-up machine vision equipment, which equipment is for determining one or more physical properties of a rolled smoking article or filter rod, the equipment comprising imaging means comprising a camera defining a field of view and being adapted to form an image of said article or rod within said field of view, and processing means for processing said image for determining one or more physical properties of said article or rod, and first supporting means for supporting said article or rod at a predetermined distance from said camera within said field of view; said method being characterised by:

providing second supporting means for supporting at least one reference object;

placing a reference object having at least one accurately known dimension on said second supporting means;

selectively moving one or more of said camera, said first supporting means and said second supporting means, such that said reference object is brought into the camera's field of view at said predetermined distance from said camera;

imaging said reference object to obtain at least one image, and processing said at least one image to determine the optimum configuration of the imaging means;

and thereafter adjusting the configuration of said imaging means to said optimum configuration.

13 A method as claimed in claim 12, characterised by obtaining and processing a series of images of said reference object whilst adjusting progressively the configuration of the imaging means, and determining the optimum configuration on the basis of said series of images.

14 A method as claimed in claim 13, characterised by adjusting the focal length of the camera while obtaining and processing serial images of the reference object to determine the optimum focal length at which the reference object is best in focus; and thereafter adjusting the focal length of the camera to said optimum focal length.

15 A method as claimed in claim 14, characterised by placing on said second supporting means a reference object having substantially the same shape and size in substantially the same orientation in said field of view as the test object.

16 A method as claimed in any of claims 12 to 15, characterised in that said camera comprises a digital camera which is adapted to form said image as a regular array of pixels.

17 A method as claimed in any of claims 12 to 16, characterised by obtaining an image of said reference object and measuring said at least one dimension, comparing the measured value of said dimension with the accurately known value, and thereafter adjusting the calibration of the imaging means such that the measured value substantially equals the known value.

18 A method as claimed in claim 17, characterised by supporting a plurality of reference objects on said second supporting means, each reference object having substantially the same shape as said article or rod, but each having a different respective, accurately known value of said at least one dimension, selectively moving one or more of the camera, first supporting means and second supporting means to bring each reference object in turn into the camera's field of view at the said predetermined distance from the camera, comparing the measured value of said at least one dimension of each reference object with the respective accurately known value, and generating a calibration curve for said imaging means on the basis of said comparisons.

19 A method as claimed in claim 18, characterised by supporting three reference objects on the second supporting means, and imaging those reference objects to produce a calibration curve based on three points.

20 A method as claimed in claim 19, wherein each reference object comprises a cylindrical bar of accurately known diameter.

21 A method as claimed in claim 20 characterised by supporting each reference object on least one respective holder, said holder defining a V-shaped cavity which is configured to receive a transverse cylindrical reference bar at the same depth into the cavity regardless of the diameter of the bar.

22 A method as claimed in 21, wherein said second supporting means comprises two holders for holding each reference object, one holder at or towards each end of the respective bar.